

## ELECTRONIC ASSEMBLY FOR IMAGE SENSOR DEVICE

### BACKGROUND OF THE INVENTION

**[0001]** 1. Field of the Invention

**[0002]** The invention relates to image sensor technology and more particularly to a package module and an electronic assembly for an image sensor device with electromagnetic interference (EMI) shielding.

**[0003]** 2. Description of the Related Art

**[0004]** Microelectronic imagers are used in digital cameras, wireless devices with picture capabilities, and many other applications. Cell phones and Personal Digital Assistants (PDAs), for example, incorporate microelectronic imagers for capturing and sending digital images. The use of microelectronic imagers in electronic devices has steadily increased as imagers have become smaller and are producing higher quality images with increased pixel counts.

**[0005]** A microelectronic imager typically includes an image sensor device, such as a charge coupled device (CCD) or a complementary metal oxide semiconductor (CMOS) image sensor device. CCD image sensors are widely used in digital cameras and other applications. CMOS image sensors are also becoming very popular due to lower production costs, higher yields, and smaller sizes, enabled by using manufacturing technology and equipment developed for fabricating semiconductor devices.

**[0006]** A typical image sensor device includes an array of pixel diodes, control circuitry, an analogue to digital converter, and an amplifier. Regardless of whether these devices are on the same chip as the sensor device, in the camera module or on the printed circuit board (PCB), protection against electromagnetic interference (EMI) resulting from electromagnetic radiation is a design challenge. If EMI protection can not be designed into a package module or electronic assembly of an image sensor device, performance may suffer.

### BRIEF SUMMARY OF THE INVENTION

**[0007]** A detailed description is given in the following embodiments with reference to the accompanying drawings. Electronic assemblies for image sensor devices are provided. An embodiment of an electronic assembly for an image sensor device comprises a package module and a lens set mounted thereon. The package module comprises a device substrate comprising an array of optoelectronic devices and at least one grounding plug therein, in which the grounding plug is insulated from the device substrate and the array of optoelectronic devices. A transparent substrate comprises a dam portion attached to the device substrate to form a cavity between the device and transparent substrates. A micro-lens array is disposed on the device substrate and within the cavity. A conductive layer is electrically connected to the grounding plug and covers the sidewalls of the lens set and the package module and the upper surface of the lens set, having an opening allowing light to reach the array of optoelectronic devices.

**[0008]** Another embodiment of an electronic assembly for an image sensor device comprises a package module and a lens set mounted thereon. The package module comprises a device substrate having front and rear surfaces and comprising an array of optoelectronic devices therein and at least one grounding pad disposed on the rear surface of the device substrate and extending to the sidewall of the device sub-

strate, in which the grounding pad is insulated from the device substrate and the array of optoelectronic devices. A transparent substrate comprises a dam portion attached to the front surface of the device substrate to form a cavity between the device and transparent substrates. A micro-lens array is disposed on the front surface of the device substrate and within the cavity. A conductive layer covers the sidewall and the upper surface of the lens set and extends to the sidewall of the device substrate to contact the grounding pad, having an opening allowing light to reach the array of optoelectronic devices.

**[0009]** Yet another embodiment of an electronic assembly for an image sensor device comprises a package module and a lens set mounted thereon. The package module comprises a device substrate comprising an array of optoelectronic devices therein. A transparent substrate comprises a dam portion attached to the device substrate to form a cavity between the device and transparent substrates. A micro-lens array is disposed on the device substrate and within the cavity. A permeability layer covers the sidewalls of the lens set and the package module and the upper surface of the lens set, having an opening allowing light to reach the array of optoelectronic devices.

### BRIEF DESCRIPTION OF DRAWINGS

**[0010]** The invention can be more fully understood by reading the subsequent detailed description and examples with references made to the accompanying drawings, wherein:

**[0011]** FIGS. 1A to 1H are cross sections of an exemplary embodiment of an electronic assembly for an image sensor device according to the invention;

**[0012]** FIG. 2 is a cross section of another exemplary embodiment of an electronic assembly for an image sensor device according to the invention; and

**[0013]** FIG. 3 is a cross section of yet another exemplary embodiment of an electronic assembly for an image sensor device according to the invention.

### DETAILED DESCRIPTION OF INVENTION

**[0014]** The following description is of the best-contemplated mode of carrying out the invention. This description is provided for the purpose of illustrating the general principles of the invention and should not be taken in a limiting sense. The scope of the invention is best determined by reference to the appended claims.

**[0015]** The invention relates to an electronic assembly for an image sensor device and a method for fabricating the same, capable of suppressing EMI. FIG. 1H illustrates an embodiment of an electronic assembly for an image sensor. The electronic assembly for the image sensor device, such as a miniature compact camera module (CCM), comprises all image sensor chip scale package (CSP) module, a lens set 126, and a conductive layer 134. The CSP module comprises a device substrate 100, a transparent substrate 160 opposite to the device substrate 100 and a micro-lens array 104 disposed therebetween. The device substrate 100, such as a silicon substrate or other semiconductor substrates may comprise a CCD or CMOS image sensor. The CCD or CMOS image sensor typically comprises an array of optoelectronic devices 102, such as pixel diodes, disposed in the device substrate 100. At least one grounding plug 114b is disposed in the device substrate 100 to be electrically connected to a corresponding conductive layer 101 formed in the device substrate